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ROBUST SUMMARY FOR 4,4'-OXYDIANILINE

Summary

4,4'-Oxydianiline is a light pink to white solid, with a melting point of 186-187°C, and an estimated boiling point of 350°C. 4,4'-Oxydianiline has a bulk density of 0.46-0.54, estimated vapor pressure of 3.07×10^{-7} mm Hg at 25°C, and $\log_{10}$ partition coefficient of 2.06. Estimated water solubility for 4,4'-oxydianiline is 139 ppm at 25°C; however, to provide more accurate data, water solubility will be measured following ASTM E1148-02. 4,4'-Oxydianiline has a flash point of 219°C and autoignition temperature of 490°C.

If released to the atmosphere, vapor-phase 4,4'-oxydianiline is expected to degrade rapidly by the reaction with photochemically produced hydroxyl radicals, with an estimated half-life of approximately 1.8 hours. Particulate phase 4,4'-oxydianiline may be removed from the atmosphere via dry deposition. Modeled data shows that 4,4'-oxydianiline will partition to the soil, and to a slightly lesser extent to water, with virtually none going to air or sediment. If released to water, hydrolysis, volatilization and bioconcentration in aquatic organisms are not expected to be important aquatic fate processes. Treatability studies indicated that 4,4'-oxydianiline is partially biodegradable, but insufficient data are available to assess the relative importance of biodegradation; therefore, a biodegradation test following OECD Guideline 301 will be performed.

Few ecotoxicological studies have been conducted with 4,4'-oxydianiline. To supplement the available data, ECOSAR (Meylan and Howard, 1999) was used to predict the aquatic toxicity of 4,4'-oxydianiline to green algae, daphnids (planktonic freshwater crustaceans), and fish. ECOSAR predictions are based on actual toxicity test data for classes of compounds with similar modes of action, i.e., the aromatic amines. Predicted $\log_{10}$ Kow values were used as input for the ECOSAR model. To help gauge the sensitivity of the prediction to this parameter, ECOSAR predictions were made using 3 Kow values. The initial Kow value was based on the estimated value from the Syracuse Research Corporation model while the other Kow values were empirically selected to be approximately 1 order of magnitude greater or less than the initial value.

Compound	$\log_{10}$ Kow	Algae, 96 hr ChV (mg/L)	Daphnid, 48 hr EC_{50} (mg/L)	Fish, 96 hr LC_{50} (mg/L)
	1.0	20	2.6	330[a]
4,4'-Oxydianiline	2.06	4.8	1.3 0.92 (M)[b]	54.4 >10 ppm (M, 24-hour)
	3.0	1.3	0.7	11

[a] Above reported water solubility.
[b] M = measured value.

Based on the ECOSAR predictions and the actual toxicity test data, 4,4-oxydianiline is likely to represent a low to medium risk to aquatic organisms or wildlife if released into the environment. However, the fish study duration of 24 hours is shorter than the required 96 hours for assessing the acute toxicity of 4,4'-oxydianiline. Additionally, there is no available test data for the algae endpoint. Therefore testing for acute toxicity in fish and algae will be performed following OECD Guidelines 203 and 201, respectively.

4,4'-Oxydianiline is slightly toxic via the oral route with an ALD and LD_{50} in rats of 1500 and 725 mg/kg, respectively. 4,4'-Oxydianiline is slightly toxic via the dermal route with an ALD in rabbits of > 5000 mg/kg. 4,4'-Oxydianiline was not a skin irritant, but was a skin sensitizer in guinea pigs. In rabbit eyes, 4,4'-oxydianiline produced slight or mild irritation, which cleared by 1 day after treatment.

In a repeated dose study, male and female rats were fed 4,4'-oxydianiline for a maximum of 23 months at levels of 200 and 400 ppm. 4,4'-Oxydianiline reduced survival time of the animals, as well as producing changes in blood chemistry. Significant retinopathy was observed in males (200 and 400 ppm) and females (400 ppm). Cataracts were also observed in males and females at 400 ppm, usually in eyes with severe, diffuse retinopathy. In addition, 4,4'-oxydianiline produced a significantly higher incidence in rate of testicular tumors in males (200 and 400 ppm) and uterine carcinoma in females (400 ppm). A bioassay for possible carcinogenicity was conducted by feeding diets containing 200, 400, or 500 ppm 4,4'-oxydianiline to male or female rats and 150, 300, or 800 ppm to male or female mice for 103 weeks. 4,4'-Oxydianiline was carcinogenic for male and female rats, including hepatocellular carcinomas or neoplastic nodules and follicular cell adenomas or carcinomas of the thyroid. 4,4'-Oxydianiline was also carcinogenic for male and female mice, inducing adenomas in the Harderian glands, hepatocellular adenomas or carcinomas in both sexes, and follicular cell adenomas in the thyroid of females.

There was no data available regarding the developmental toxicity of 4,4'-oxydianiline; therefore a developmental toxicity study via the oral route, following OECD Guideline 414, will be performed. In a 1-generation reproduction study in rats, an adverse effect on reproduction/lactation performance at 400 ppm was observed (decreased mean number of pups per litter and decreased mean female weanling body weight per litter), but only at a dose level that produced toxic effects in the dams (decreased mean body weights, weight gain, and food efficiency). The no-observed-effect-level (NOEL) in the reproduction substudy was 100 ppm.

4,4'-Oxydianiline was mutagenic in *Salmonella typhimurium* and was positive in an *in vitro* chromosome aberration and sister chromatid exchange assay in Chinese hamster ovary (CHO) cells, as well as in an *in vivo* mouse micronucleus assay. 4,4'-Oxydianiline was negative in an *in vivo* unscheduled DNA synthesis (UDS) assay, however, a number of *in vitro* UDS assays produced positive findings. A variety of other genetic toxicity tests produced results ranging from negative to equivocal to positive and are listed as additional references in the genetic toxicity section of the robust summary.

Because 4,4'-oxydianiline (ODA) reacts rapidly and completely in the chemical processes used by DuPont, exposure of customers to ODA from handling DuPont products made with it is not

expected. Exposure to ODA during transportation is minimized as DuPont imports ODA from Japan in sea containers, and ships ODA between DuPont sites in sealed drums in dedicated trucks. There is potential for exposure during shipping only if container integrity is compromised. Specific manufacturing procedures and industrial hygiene programs in place at DuPont manufacturing sites limit the potential for exposure of DuPont employees to ODA during the manufacturing process.

Reference for the Summary:

Meylan, W. P. and P. H. Howard (1999). User's Guide for the ECOSAR Class Program, Version 0.993 (Mar 99), prepared for J. Vincent Nabholz and Gordon Cas, U.S. Environmental Protection Agency, Office of Pollution, Prevention, and Toxics, Washington, DC; prepared by Syracuse Research Corp., Environmental Science Center, Syracuse, NY 13210 (submitted for publication).

TEST PLAN FOR 4,4'-OXYDIANILINE

4,4'-Oxydianiline **CAS No. 101-80-4**	**Data Available**	**Data Acceptable**	**Testing Required**
	Y/N	**Y/N**	**Y/N**
PHYSICAL/CHEMICAL CHARACTERISTICS			
Melting Point	Y	Y	N
Boiling Point	Y	Y	N
Vapor Pressure	Y	Y	N
Partition Coefficient	Y	Y	N
Water Solubility	Y	N	Y
ENVIRONMENTAL FATE			
Photodegradation	Y	Y	N
Stability in Water	Y	Y	N
Transport (Fugacity)	Y	Y	N
Biodegradation	Y	N	Y
ECOTOXICITY			
Acute Toxicity to Fish	Y	N	Y
Acute Toxicity to Invertebrates	Y	Y	N
Acute Toxicity to Aquatic Plants	Y	N	Y
MAMMALIAN TOXICITY			
Acute Toxicity	Y	Y	N
Repeated Dose Toxicity	Y	Y	N
Developmental Toxicity	N	N	Y
Reproductive Toxicity	Y	Y	N
Genetic Toxicity Gene Mutations	Y	Y	N
Genetic Toxicity Chromosomal Aberrations	Y	Y	N